

## CLAIMS

1. An amplifier comprising:  
a monolithic semiconductor substrate and  
means disposed on said substrate for coherently receiving and retransmitting  
electromagnetic energy.
2. The invention of Claim 1 wherein said means disposed on said substrate for  
coherently reflecting electromagnetic energy includes an array of cells.
3. The invention of Claim 2 wherein each of said cells includes a first  
antenna for receiving said electromagnetic energy.
4. The invention of Claim 3 wherein each of said cells includes an amplifier  
connected to said antenna.
5. The invention of Claim 4 wherein each of said cells includes a second  
antenna for transmitting said electromagnetic energy.
6. The invention of Claim 5 wherein at least one of said antennas is a patch  
antenna.
7. The invention of Claim 6 wherein said patch antenna is a corrugated patch  
antenna.
8. The invention of Claim 1 wherein each of said cells includes a dual  
polarization antenna structure.

9. The invention of Claim 1 further including means for splitting a received wavefront, reflecting a portion thereof and transmitting a portion thereof.

10. The invention of Claim 5 further including means for receiving and retransmitting a beam of electromagnetic energy while controlling the direction thereof.

11. The invention of Claim 10 wherein said means for receiving and retransmitting a beam of electromagnetic energy while controlling the direction thereof includes a phase shifter coupled between said first and said second antennas.

12. The invention of Claim 10 wherein said means for receiving and retransmitting a beam of electromagnetic energy while controlling the direction thereof includes at least one phase shifter coupled between at least two of said cells.

13. An amplifier comprising:

an ortho-mode feed and

a reflective amplifier array adapted to be illuminated by said feed with an input wavefront with a first polarization and to return thereto an amplified wavefront  
5 with a second polarization orthogonal to said first wavefront.

14. The invention of Claim 13 wherein said array includes:

a monolithic semiconductor substrate and

means disposed on said substrate for coherently receiving and retransmitting electromagnetic energy.

15. The invention of Claim 14 wherein said means disposed on said substrate for coherently reflecting electromagnetic energy includes an array of cells.

16. The invention of Claim 15 wherein each of said cells includes a first antenna for receiving said electromagnetic energy.

17. The invention of Claim 16 wherein each of said cells includes an amplifier connected to said antenna.

18. The invention of Claim 17 wherein each of said cells includes a second antenna for transmitting said electromagnetic energy.

19. The invention of Claim 18 wherein at least one of said antennas is a patch antenna.

20. The invention of Claim 16 said patch antenna is a corrugated patch antenna.

21. The invention of Claim 13 further including feed means for illuminating said array.

22. The invention of Claim 21 wherein said feed means includes means for illuminating said array with a spherical wavefront.

23. The invention of Claim 22 further including means for converting said spherical wavefront to a planar wavefront.

24. The invention of Claim 23 wherein said means for converting said spherical wavefront to a planar wavefront includes at least one reflective element.

25. The invention of Claim 24 wherein said means for converting said spherical wavefront to a planar wavefront includes first and second mirrors.

26. The invention of Claim 25 wherein said first and second mirrors are dual shaped mirrors.

27. The invention of Claim 18 further including means for receiving and retransmitting a beam of electromagnetic energy while controlling the direction thereof.

28. The invention of Claim 27 wherein said means for receiving and retransmitting a beam of electromagnetic energy while controlling the direction thereof includes a phase shifter coupled between said first and said second antenna.

29. The invention of Claim 27 wherein said means for receiving and retransmitting a beam of electromagnetic energy while controlling the direction thereof includes at least one phase shifter coupled between at least two of said cells.

30. A method for coherently receiving and retransmitting an electromagnetic wavefront including the steps of:

receiving said electromagnetic wavefront and  
coherently receiving and retransmitting said electromagnetic wavefront using  
5 an array of cells disposed on a monolithic semiconductor substrate.

31. The invention of Claim 30 further including the step of dynamically controlling the direction of said retransmitted electromagnetic wavefront.

32. A method for coherently reflecting an electromagnetic wavefront including the steps of:

receiving said electromagnetic wavefront and providing a spherical wavefront  
in response thereto;  
5 converting said spherical wavefront to a planar wavefront and

coherently reflecting said planar wavefront using an array of cells disposed on a monolithic semiconductor substrate.

33. The invention of Claim 32 further including the step of converting said reflected planar wavefront to a spherical wavefront.